



# S4 interface Support For Non-EPC Devices

This chapter describes the S4 interface support for Non-EPC capable devices.

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## Feature Description

The S4 interface support has been extended to Non-EPC capable devices. This support was only available for EPC service capable devices or subscribers with EPS subscription. S4 interface support to Non-EPC devices allows more control on interface selection and ability to handle QoS and legacy UE related behavior issues.

## Overview

To enable S4 support for Non-EPC devices, interface selection options during first PDP activation have been added, these options allow the following:

1. S4 interface selection based on UEs EPC capability alone.
2. S4 interface selection only for UEs that are EPC capable and those that have EPS subscription.
3. S4 interface selection for all UEs having EPS subscription.
4. An option to always select S4 interface.



### Important

For all the options listed above (except option "2"), the HSS/HLR subscription could have both EPS and GPRS subscription. In such cases, the S4-SGSN prefers EPS subscription, but chooses the subscription that has the record for requested or default APN. The type of subscription chosen during the first PDP context activation is stored as UE level information and this is used to choose the same subscription for all subsequent primary PDP activations by the UE.

When the S4 interface is used and a Non-E-UTRAN capable device requests for PDP de-activation of only the primary PDP without de-activating the associated secondary PDP's (that is, without a teardown indicator), the SGSN deletes the associated secondary PDP contexts locally without informing UE.

When a Non-E-UTRAN capable UE activates a PDP context with Conversational or Streaming class (GBR bearers) and if Iu is released, the UE preserves the PDP with bit rate set to "0" kbps. However, when the S4-SGSN notices an Iu-Release, it has to de-activate the GBR bearers. Currently the S4-SGSN does not support the de-activation of GBR bearers. When S4-SGSN support for PDP context preservation procedures is added in a future release (for both EPC and Non-EPC devices), GBR bearers will be de-activated without informing the UE.

## How it Works

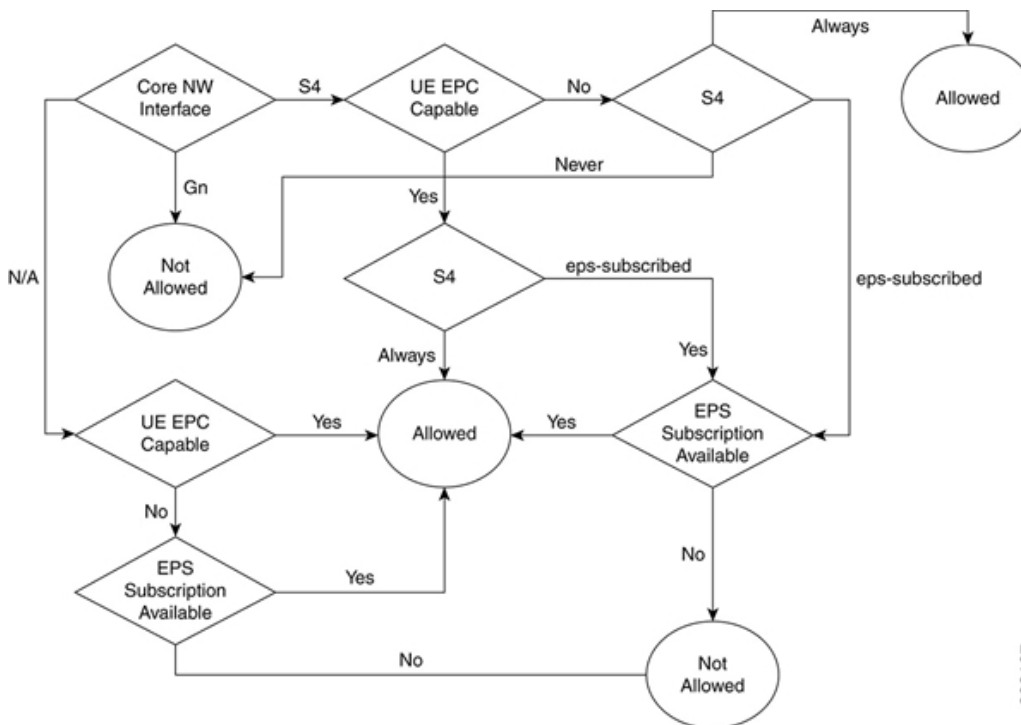
### Architecture

To implement S4 interface support for Non-EPC capable devices the existing CLI command **sgsn-core-nw-interface** under the Call-Control-Profile configuration has been enhanced with options for interface selection during first PDP activation, the various options include:

1. Option to select the S4 interface based on UE's EPC capability alone.
2. Option to select the S4 interface only for UEs that are EPC capable and those that have EPS subscription.
3. Option to select the S4 interface for all UEs having EPS subscription
4. Option to select the S4 interface always.

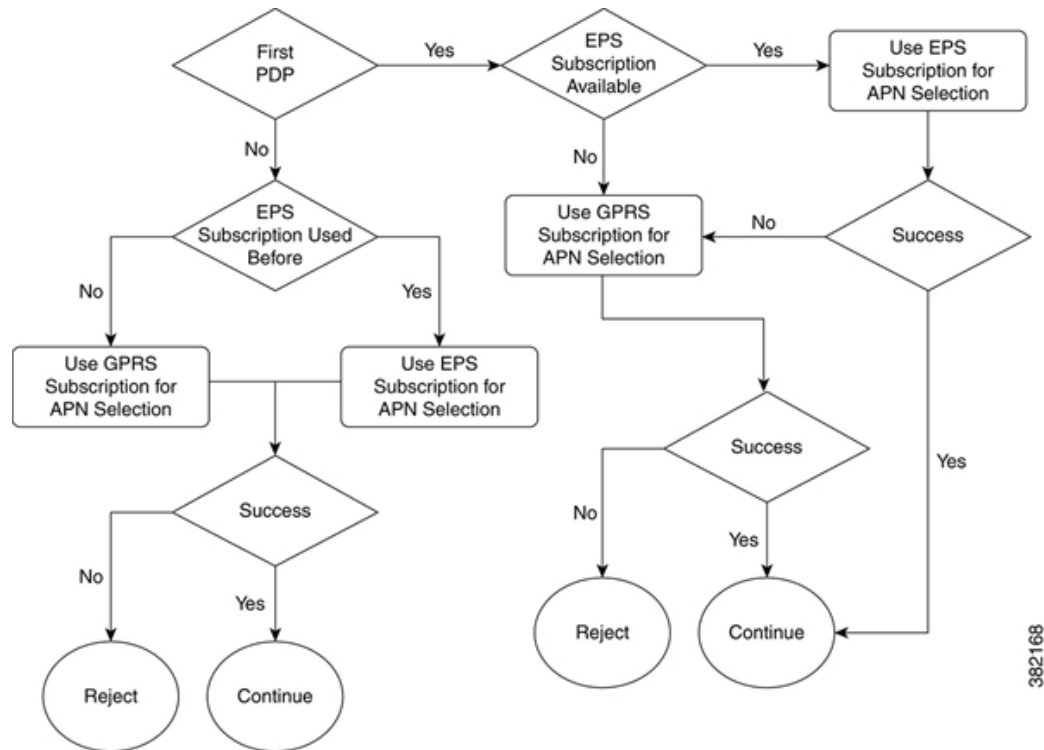
Various combinations of the options listed above can be configured and the logic UE can use the S4 interface based on the following logic:

Figure 1:



When the S4 interface is allowed, APN selection is performed based on the following logic:

Figure 2:



For more information on the CLI commands see, *Command Line Interface Reference*.

## Limitations

1. QoS modification of non-GBR bearer - A Non-E-UTRAN capable UE can request QoS bit rate modification even for Non-GBR bearers. This functionality is currently not supported. The MS initiated QoS modification for primary PDP is rejected and QoS modification for non-GBR secondary PDP is handled by sending BRC with zero Flow QoS. The PGW can respond with UBR (with modified APN-AMBR) or DBR and both are handled appropriately.
2. Restricting APN-AMBR to "472" Kbps after 3G to 2G IRAT - Restricting APN-AMBR to "472" Kbps after 3G to 2G IRAT is based on the assumption that the PGW /PCRF decide on correct QoS based on RAT, hence additional signaling can be avoided. However, upgrading of APN-AMBR after 2G to 3G IRAT is supported, the SGSN can initiate bearer modification based on RNC / UE capabilities and same are honored by PGW/PCRF.

## Configuring S4 Interface Support for Non-EPC Capable Devices

This section describes how to configure S4 interface support for Non-EPC capable devices.

### Configuring selection of the S4 interface

The command `sgsn-core-nw-interface` in the Call-Control-Profile configuration is enhanced with keywords to support S4 interface selection:

```

config
call-control-profile cc-profile name
  sgsn-core-nw-interface {gn | s4 [epc-ue {always | eps-subscribed} non-
epc-ue {never | always | eps-subscribed}]}
exit

```

Notes:

- When keywords or options are not selected with the selection of the S4 interface option, it implies that the SGSN will apply S4 interface always for both EPC and Non- EPC devices. This is also synonymous to the CLI command configured as **sgsn-core-nw-interface s4 epc-ue always non-epc-ue always**.
- To configure SGSN behavior, the CLI is configured as **sgsn-core-nw-interface s4 epc-ue always non-epc-ue eps-subscribed**. This is also the default behavior when the CLI is not configured.

*For more information on the CLI commands see, Command Line Interface Reference.*

## Monitoring and Troubleshooting S4 Interface Support for Non-EPC Capable devices

This section provides information on how to monitor S4 interface support for Non-EPC capable devices and to determine that it is working correctly.

### S4 Interface Support for Non-EPC devices Show Command(s) and/or Outputs

This section provides information regarding show commands and/or their outputs in support of the S4 interface support for Non-EPC devices.

#### show call-control-profile full name < >

This show command is updated with information about SGSN core network interface selection. The following new fields have been added:

- SGSN Core Network Interface Selection
- SGSN Core Network Interface Type
- S4 for EPC Capable Devices
- S4 for Non-EPC Capable Devices

The field **SGSN Core Network Interface Type** displays interface selected as either **Gn** or **S4**.

The field **S4 for EPC Capable Devices** displays the configuration as either **Always** or **When EPS Subscription Available**, based on the CLI configured in the command **sgsn-core-nw-interface** in the Call-Control Profile.

The field **S4 for Non-EPC Capable Devices** displays the configuration as **Never** or **Always** or **When EPS Subscription Available**, based on the CLI configured in the command **sgsn-core-nw-interface** in the Call-Control Profile.

#### show subscribers sgsn-only full imsi < >

This show command is updated to display the subscription type being used for primary PDP activation. The field **Subscription Type** is added to the show output. The subscription type is displayed as either **EPS** or **GPRS**.

## show subscribers gprs-only full imsi < >

This show command is updated to display the subscription type being used for primary PDP activation. The field **Subscription Type** is added to the show output. The subscription type is displayed as either **EPS** or **GPRS**.

show subscribers gprs-only full imsi <>